Heavy Duty Coil Tubing Pressure Activated Firing Head with Auto Vent TC-032-2750-000

MAN-TC-032-2750(R02)

Owen Oil Tools

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Warning: Use of Owen equipment contrary to manufacturer's specifications or operating instructions may result in property damage, serious injury or fatality. If you are not trained in the handling and use of explosive devices, do not attempt to use or assemble any Owen perforating systems or Owen firing devices.

Owen Oil Tools pre-assembles its tools as per the field operating manual. It is the responsibility of the purchaser to insure that this tool is assembled as required, prior to use.

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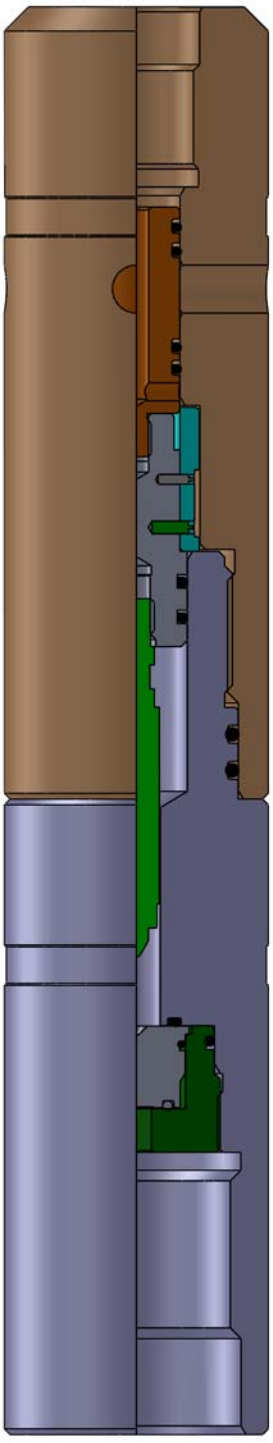


Description

The Heavy Duty Coil Tubing Pressure Activated Firing Head with Auto Vent was developed for use where pressure firing is required such as horizontal wells or well stimulation. The Auto Vent provides a method for venting the tubing prior to pulling out. It also provides the ability to see a pressure drop upon tool activation.

Features and Benefits

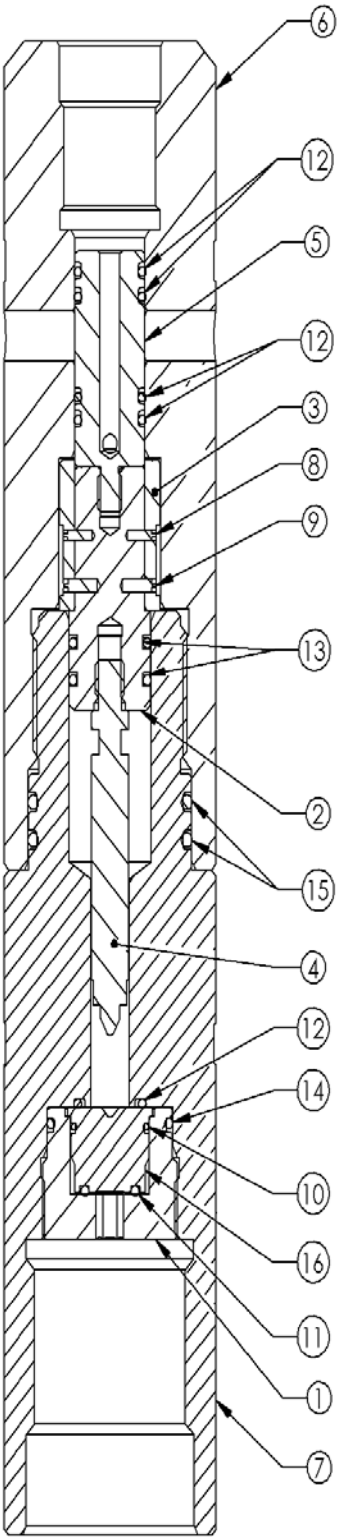
- Many parts are common with the standard TC-032 Firing Head.
- Can be placed on top or bottom of all Owen Scalloped Gun Systems (2-3/4" and 2-7/8").
- Well suited for highly deviated wells.
- **Operating range 2000 psi (14 MPa) to 12,000 psi (84 MPa).
- The top thread is 1.25" OD - 10 TPI stub acme unless otherwise specified.

****it is not recommended this tool be run above 12,000 psi (84 MPa) as damage may occur**

O.D.	2.750 in	70 mm
Max. Temperature [1]	250°F (121°C)	
Max. Hydrostatic [2]	12,000 psi	83 MPa
Min. Hydrostatic	2,000 psi	13.8 MPa
Max. Tensile Strength	100 000 lbs.	44 500 daN

[1] The maximum temperature can be increased to 450° (230°C) by substituting the 90 durometer Nitrile O-rings with 90 durometer Viton O-rings. Refer to the Time vs Temperature chart for Explosives to confirm any explosives requirements.

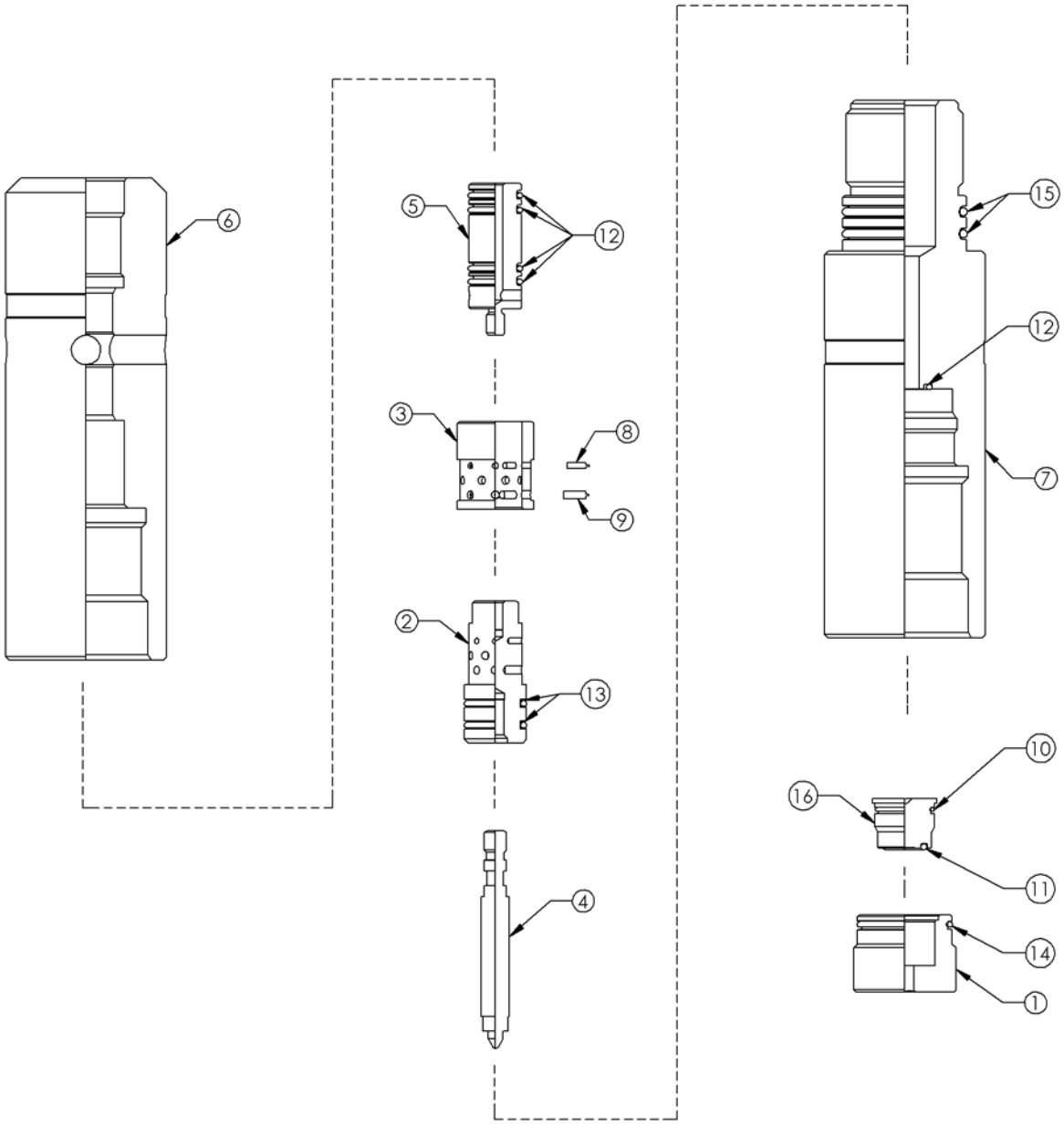
[2]Can be run only once successfully at set pressures between 12,000 and 18,000 psi, as the firing head will be damaged making subsequent runs impossible.



Item	Part Number	Qty	Description
--	**TC-032-2750-000**	--	**Heavy Duty Coil Tubing Pressure Activated Firing Head with Auto Vent**
1	TC-011-0002-000	1	Initiator Retaining Nut
	TC-020-0003-000	1	Piston/Shear Ring Set (matched Set)
2	TC-020-0004-000		Shear Piston
3	TC-020-0005-000		Outer Shear Ring
4	TC-020-0007-000	1	Firing Pin with Flats
5	TC-032-0011-000	1	Venting Piston
6	TC-032-0016-000	1	H.D. Upper Housing (Venting)
7	TC-032-0017-000	1	H.D. Bottom Sub
8	SF-010-0100-038	8	Shear Pin -small diameter
9	SF-010-0130-045	16	Shear Pin -large diameter
10	OOO-N569-020	1	O-Ring, 90 Durometer
11	OOO-N569-113	1	O-Ring, 90 Durometer
12	OOO-N569-116	5	O-Ring, 90 Durometer
13	OOO-N569-118	2	O-Ring, 90 Durometer
14	OOO-N569-127	1	O-Ring, 90 Durometer
15	OOO-N569-225	2	O-Ring, 90 Durometer
16	Reference	--	Percussion Detonator
--	TC-032-2750-099	--	Redress Kit, PAFH
--	**MAN-TC-032-2750**	--	**Assembly Manual**

For information concerning the different adapters and crossovers for the downhole devices which might be run with this firing head, please contact our Sales or Technical Department.

Item	Part Number	Qty	Description
--	**TC-032-2750-099**	--	**Re-Dress Kit, PAFH**
4	TC-020-0007-000	1	Firing Pin with Flats
8	SF-010-0100-038	8	Shear Pin - small diameter
9	SF-010-0130-045	16	Shear Pin - large diameter
10	OOO-N569-020	1	O-Ring 90 Durometer
11	OOO-N569-113	1	O-Ring 90 Durometer
12	OOO-N569-116	5	O-Ring 90 Durometer
13	OOO-N569-118	2	O-Ring 90 Durometer
14	OOO-N569-127	1	O-Ring 90 Durometer
15	OOO-N569-225	2	O-Ring 90 Durometer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Assembly Instructions

Lightly grease all O-rings before installation

1. Install O-rings (Item 13) on Shear Piston (item 2). Apply loctite (use appropriate temperature rating) to threads of firing pin (item 4), thread it into Shear Piston and tighten.

2. Slide the Shear Ring (item 3), over the Shear Piston. Make sure the alignment marks on the top of the piston and the top of the Shear Ring are lined up (see photo below). This will ensure all the Shear Pins go into place. Now install the Shear Pins (Items 8 and 9) as required.

3. Install the O-rings (Item 12) on the Venting Piston (item 5), thread and tighten venting Piston into the top of the Shear Piston (Item 2).

4. Install O-rings (item 15) on H.D. Bottom Sub (item 7).

5. Take the Piston Assembly (from Step 2) and insert the Venting Piston first into the H.D. Upper Housing (item 6). Push until the Shear Ring (item 3) shoulders out in the H.D. Upper Housing.

6. Now install the H.D. Bottom Sub (item 7) over the Piston Assembly (item 2 and 3). Thread the H.D. Upper Housing (Item 6) on to the H.D. Bottom Sub (item 7) and tighten.

7. Last step done on location just prior to well operation. Install O-ring (item 12) into Bottom Sub (item 7).Install O-ring (item 14) onto Initiator Retaining Nut (item1). Install O-rings (items 10 and 11) onto the CP Initiator (item 16). Carefully push CP Initiator (item 16) into place in the Initiator Retaining Nut (item 1). Thread Initiator Retaining Nut back into the H.D. Bottom Sub (item 7) and tighten with Allen Key.

Caution: do not use any sharp object to push the CP Initiator into place

Pinning Procedures

Imperial Units

Step 1 (Data)

A. Well Temperature (BHT) at perforating depth _____°F
B. True Vertical Depth (TVD) _____ ft
C. Maximum fluid weight in well when tripping _____ ppg (lb/gal) (Annulus)
D. Fluid Weight in tubing when ready to fire _____ ppg (lb/gal)

Step 2 (Calculate Pressures)

E. Maximum Hydrostatic at depth
(0.05195 * B * C) = _____ psi
F. Tubing hydrostatic when ready to fire
(0.05195 * B * D) = _____ psi
G. Greater of E or F _____psi
H. Absolute Firing Pressure
(G + 2000 psi (minimum safety factor) = _____ psi

Step 3 (Calculate number of pins)

I. Reduction Factor
(Ref. Temp. Reduction Chart with temp from A) = _____
J. Adjusted Large Pin rating (.130" diameter)
(_____ psi * I) = _____ psi / pin @ BHT
Reference: pin shipping bag for listed pin value to use
K. Adjusted Small Pin rating (.100" diameter)
(_____ psi * I) = _____ psi / pin @ BHT
Reference: pin shipping bag for listed pin value to use
L. Number of Large Pins
(H / J) = _____
M. Round Down L = _____
N. Number of Small Pins
{(L – M) * J } / K = _____
O. Round Up N = _____

Pinning Procedures
Imperial Units

Step 4 (Calculate Nominal Absolute Firing Pressure)

P. Large Pin Psi @ BHT
(M * J) = _____ psi

Q. Small Pin Psi @ BHT
(O * K) = _____ psi

R. Total Absolute Pressure @ BHT
(P + Q) = _____ psi

Step 5 (Calculate pressure tolerance)

S. Tolerance (R * 0.05) = _____ psi

Step 6 (Calculate surface pressure) - Pressure applied on tubing

T. Nominal pressure (R - F) = _____ psi

U. Maximum pressure (T + S) = _____ psi

V. Minimum pressure (T - S) = _____ psi

Shear Pin Temperature Correstion

Degrees Farenheit	Correction Factor	Degrees Farenheit	Correction Factor	Degrees Farenheit	Correction Factor	Degrees Farenheit	Correction Factor
70	1	180	0.944	290	0.9025	400	0.882
80	0.995	190	0.9395	300	0.898	410	0.884
90	0.988	200	0.935	310	0.897	420	0.885
100	0.9825	210	0.9315	320	0.8945	430	0.886
110	0.9775	220	0.9275	330	0.8925	440	0.888
120	0.9725	230	0.9235	340	0.89	450	0.89
130	0.9675	240	0.9195	350	0.888	460	0.894
140	0.962	250	0.9165	360	0.887	470	0.9
150	0.957	260	0.9125	370	0.886		
160	0.953	270	0.909	380	0.8845		
170	0.9485	280	0.906	390	0.8835		

Pinning Procedures
Metric Calculations

Step 1 (Data)

A. Well Temperature (BHT) at perforating depth _____°C
B. True Vertical Depth (TVD) _____ m
C. Maximum fluid weight in well when tripping _____ kg/m3
D. Fluid Weight in tubing when ready to fire _____kg/m3

Step 2 (Calculate Pressures)

E. Maximum Hydrostatic at depth
(0.00981 * B * C) = _____ kPa
F. Tubing hydrostatic when ready to fire
(0.00981 * B * D) = _____ kPa
G. Greater of E or F _____ kPa
H. Absolute Firing Pressure
(G + 14000 kPa) {minimum safety factor} = _____ kPa

Step 3 (Calculate number of pins)

I. Reduction Factor
(Ref. Temp. Reduction Chart with temp from A) = _____
J. Adjusted Large Pin rating (.130" dia.)
(_____ kPa * I) = _____ kPa / pin @ BHT
Reference: pin shipping bag for listed pin value to use
K. Adjusted Small Pin rating (.100" dia.)
(_____ kPa * I) = _____ kPa / pin @ BHT
Reference: pin shipping bag for listed pin value to use
L. Number of Large Pins
(H / J) = _____
M. Round Down L = _____
N. Number of Small Pins
{(L – M) * J } / K = _____
O. Round Up N = _____

Pinning Procedures
Metric Calculations

Step 4 (Calculate Nominal Absolute Firing Pressure)

P. Large Pin kPa @ BHT
(M * J) = _____ kPa

Q. Small Pin kPa @ BHT
(O * K) = _____ kPa

R. Total Absolute Pressure @ BHT
(P + Q) = _____ kPa

Step 5 (Calculate pressure tolerance)

S. Tolerance (R * 0.05) = _____ kPa

Step 6 (Calculate surface pressure) - Pressure applied on tubing

T. Nominal pressure (R - F) = _____ kPa

U. Maximum pressure (T + S) = _____ kPa

V. Minimum pressure (T - S) = _____ kPa

Step 4 (Calculate Nominal Absolute Firing Pressure)

Degrees Celcius	Correction Factor	Degrees Celcius	Correction Factor	Degrees Celcius	Correction Factor	Degrees Celcius	Correction Factor
21	1	82	0.944	143	0.9025	204	0.882
27	0.995	88	0.9395	149	0.898	210	0.884
32	0.988	93	0.935	154	0.897	216	0.885
38	0.9825	99	0.9315	160	0.8945	221	0.886
43	0.9775	104	0.9275	166	0.8925	227	0.888
49	0.9725	110	0.9235	171	0.89	232	0.89
54	0.9675	116	0.9195	177	0.888	237	0.894
60	0.962	121	0.9165	182	0.887	243	0.9
66	0.957	127	0.9125	188	0.886		
71	0.953	132	0.909	193	0.8845		
77	0.9485	138	0.906	199	0.8835		